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Design and analysis of smart seat belt system

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ABSTRACT

A smart seat belt system for a vehicles disclosed, that comprises a seat belt assembly configured with a seat of the vehicle; a set of sensors configured to sense parameters of the belt assembly, a user associated with the seat and the vehicle, and generate signals based on the sensed parameters; and a processor coupled with a memory, the memory storing instructions executable by the processor to: extract the parameters from the generated signals; and compare the extracted parameters with pre-defined parameter values stored in a database, wherein based on comparison generate, when the extracted parameters are more than the set of predefined values, alert signals and control signals; a control unit configured to control vehicular parameters of the vehicle based on the generated control signals; and a notification unit configured to generate any of a visual alert and an audio alert based on the generated alert signals to alert the user.

Keywords: Smart seat belt, Sensor, Static analysis

INTRODUCTION

Road traffic injuries are a major public health problem and a leading cause of death and injury around the world. Each year nearly 1.2 million people die and millions more are injured or disabled as a result of road crashes, mostly in low-and middle-income countries. As well as creating enormous social costs for individuals, families and communities, road traffic injuries place a heavy burden on health services and economies. The cost to countries, many of which already struggle with economic development, may be as much as 1–2% of their gross national product. As motorization increases, preventing road traffic crashes and the injuries they inflict will become an increasing social and economic challenge, particularly in developing countries. If present trends continue, road traffic injuries will increase dramatically in most parts of the world over the next two decades, with the greatest impact falling on the most vulnerable citizens [1-5].

Seatbelts are designed to retain people in their seats, and so prevent or reduce injuries suffered in a crash. They ensure that as little contact is made between the occupant and vehicle interior as possible and significantly reduce the risk of being thrown from a vehicle. Seatbelts are designed to work as the key part of wider injury prevention measures and safety systems, such as airbags and head restraints, which will not be as effective in reducing the risk of injury if an occupant is not wearing a seat belt [6-9].

The extent to which different road users are affected by road traffic injuries also differs between countries. The distribution of those killed in various modes of transport in different countries of those killed on the roads in high-income countries, the majorities are drivers and passengers in cars. The data that vehicle occupants account for as much as 80% of all road traffic deaths in the United States of America, but only 10–20% in countries in South-East

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Asia, where two wheeler motorized traffic predominates.

However, although in low- and middle-income countries car occupants do not comprise the majority of fatalities on the road, experience from high-income countries suggests that as car ownership rises so too will the number of vehicle occupant deaths and injuries.

Experience from rapidly motorizing nations to date concurs with these trends: for example, in 2003 more than 12 000 new cars were registered every day in China, while in Viet Nam official sources report that 600 new cars are being registered every day. The use of seat-belts and child restraints could prevent many of these deaths and serious injuries that occur among four-wheeled vehicle occupants.

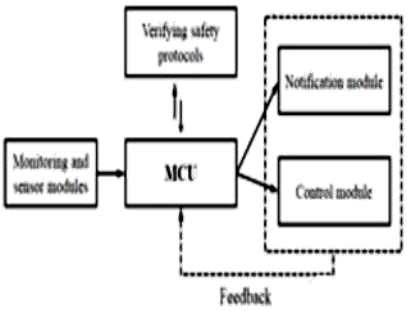


Fig.1 MCU simple block diagram

LITERATURE REVIEW

The first invention of seat belt

The first U.S. patent for automobile seat belts was issued to Edward J.Claghorn of New York, New York on February 10, 1885. Claghorn was granted United States Patent #312,085 for a Safety-Belt for tourists, described in the patent as "designed to be applied to the person, and provided with hooks and other attachments for securing the person to a fixed object."

Nils bohlin & modern seat belts

Swedish inventor, Nils Bohlin invented the

Three - point seat belt - not the first but the modern seat belt - now a standard safety device in most cars. Nils Bohlin's lap-and-shoulder belt was introduced by Volvo in 1959.

A history of seat belts

The seat belt is one of our best protections in a car crash. In fact, according to the Centre's for Disease Control and Prevention, "seat belt use is the most effective way to save lives and reduce injuries in crashes as more than half (range from 53% – 59%) of teens and aged 13 – 44 years who died in crashes in 2014 were unrestrained at the time of the crash. "In short, seat belts save lives, but how did then end up in our cars in the first place?

The seat belt was invented by George\ Cayley, an English engineer in the late 1800's who created these belts to help keep pilots inside their gliders. However, the first patented seat belt was created by American Edward J. Claghorn on February 10, 1885 in order to keep tourists safe in taxis in New York City.

Over time, the seat belt slowly starting showing up in manufacture cars to help passengers and drivers stay put inside their car seats. There was less concern for overall driving safety.

Once the idea of safety benefits of seat belts caught on in the U.S. public, sales of seat belts skyrocketed. Auto companies offered seat belts as optional equipment and were even sold at local gas stations.

Seat belt terminology

- 2-Point Seat Belt: A restraint system with two attachment points. A lap belts.
- 3-Point Seat Belt: A seat belt with both a lap and a shoulder portion, having three attachment points (one shoulder, two hips).

Fig.2 Modelling of smart seat belt

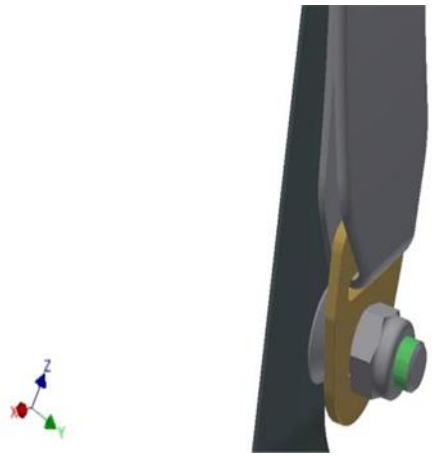


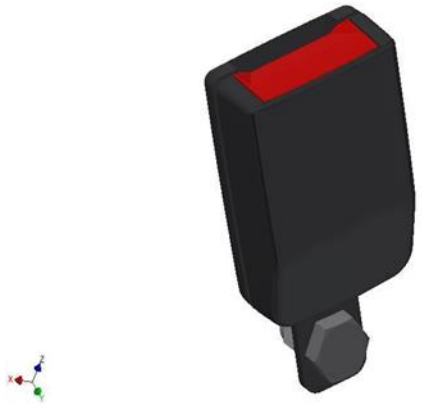
Fig. 3 Part 1

Fig.4 Part 2

WORKING

In an aspect, the present disclosure provides a smart seat belt system for a vehicle, the seat belt system comprising a seat belt assembly configured with a seat of the vehicle, seat belt assembly comprises a seat belt retractor, a belt strap, a tongue; and a seat belt buckle; a set of sensors configured with the seat belt assembly, the set of sensors configured to sense one or more parameters of the seat belt assembly.

Sensing and conforming the wearing of seat belt. If seat belt not wearing, shouting down or taking control under AI of vehicle. While driving any occupant removes the seat belt then vehicle speed is to be gradually decreased by under the control of AI and notifying them to wear the seat belts again. Ensuring driver doesn't takes any drinks whiles driving.



Breath Analyzer should be included so as to check the alcohol in-take by the driver. Vehicle gear lock can be unlocked only when the alcohol content is ideal. Contacting emergency number if any abnormal thinks or damage or injury happened while traveling.

The body sensor detects whether the occupant is luggage or person. If it is a luggage the seat belt is optional. And if that is a person he must wear seat belt for start the vehicle.

ANALYSIS

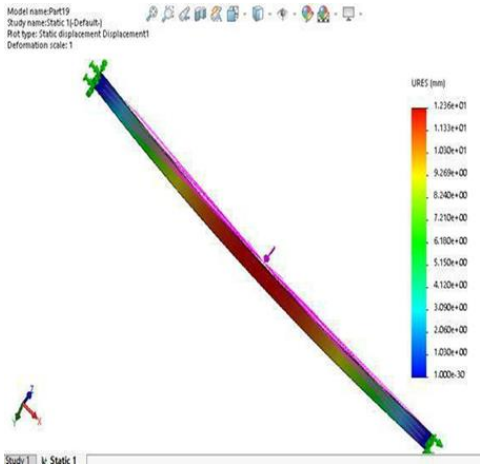


Fig.5 Modelling of buckle

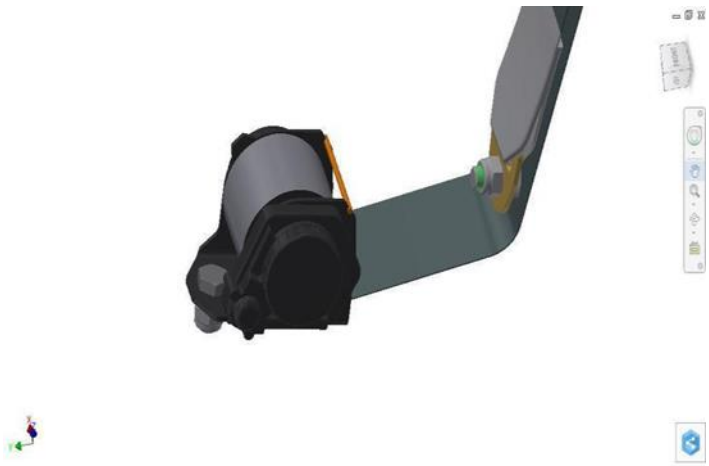


Fig.6 Modelling of retractor

MODEL OF INFORMATION

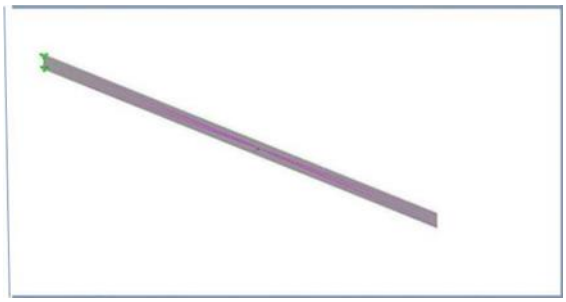


Fig.7 Model of information

STUDY RESULTS

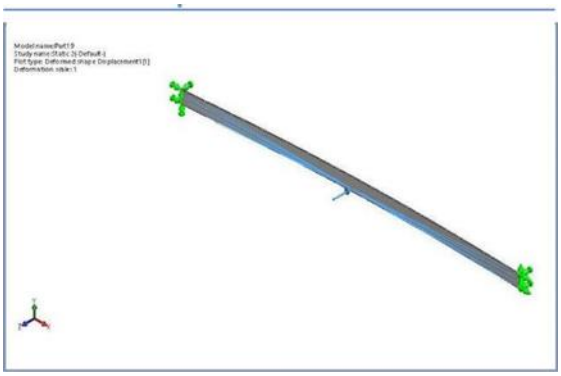


Fig.8 Static analysis

Table.1 Von mises stress

Name	Type	Min	Max
Stress1	VON: von Mises Stress	1.897e+05 N/m^2 Node: 4386	2.313e+07 N/m^2 Node: 561

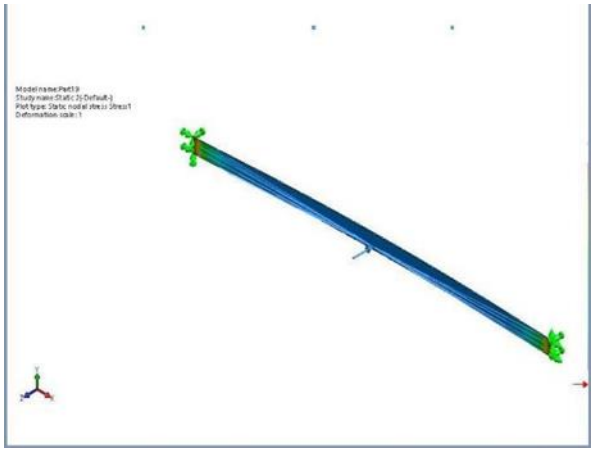


Table.2 Resultant displacement

Name	Type
Displacement 1 (1)	Deformed shape

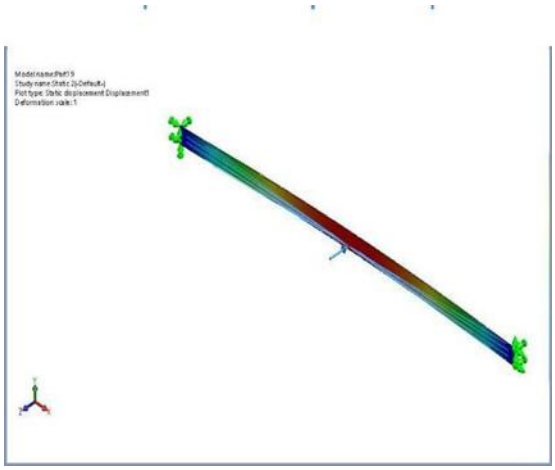


Table.3 Deformed shape displacement

Name	Type
Displacement 1 (1)	Deformed shape

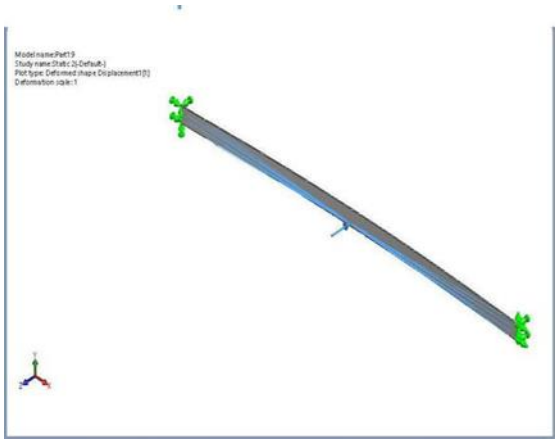


Table.4 Equivalent stress displacement

Name	**Type**	**Min**	**Max**
Strain 1	ESTRN Equivalent Stress	: 3.456e-05 Element 1615	1.920e-03 : Element: 7507

STUDY PROPERTIES

Table.5 Properties

	Nylon belt – part
Study name	008
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	On
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	(C:\allinno.r&d.pvt .ltd\Desktop)

CONCLUSION

Finally in the seat belt system, the novelty and functions and working concept with ad model of seat belt with AI system is done and the invention was patented in India also the design is created in solid woks also analysis done in solid works simulation.

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